



Psychological safety: Its effects on safety critical operations and its integration into Bridge Teamwork.

A narrative literature review

Bachelor thesis for Master Mariner Program

HUSEEN RAHMOUN
MUSTAFA SAID ESSA

DEPARTMENT OF MECHANICS AND MARITIME SCIENCES

CHALMERS UNIVERSITY OF TECHNOLOGY
Göteborg, Sweden, 2022

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PREFACE

First, we want to send our greatest gratitude to our supervisor Fredrik Forsman. Thank you for your ideas, your coaching, and your never-ending excitement during this time! Further, we would like to thank Reto Weber and Mats Gruvefeldt for their help in finding relevant material and providing their expert opinion. We would also like to thank our friend Ebaa Asaad for his insight and support during this project. Finally, we would love to thank our families and friends for their never-ending love and support.

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Husse Rahmoun

Mustafa Said Essa

Department of Mechanics and Maritime Sciences
Chalmers University of Technology

SAMMANDRAG (in Swedish)

I takt med att världen blir allt mer beroende av varandra, fokuserar organisationer mer på lagarbete för att förbättra både effektiviteten på arbetet och säkerheten. Psykologisk säkerhet är en viktig del av ett teams effektivitet. Psykologisk säkerhet definieras som ett klimat där en person är säker att lyfta fram sina idéer, rapportera misstag och säga ifrån utan rädsla för förnedring eller skuld. lagarbets effektivitet ombord erkänns av International Maritime Authority som en nyckelfaktor för säkerheten.

Denna artikel analyserar ifall, och hur, psykologisk säkerhet är integrerad i Standard of Watchkeeping at Sea (STCW) utbildning samt i kraven på sjöfolk. Denna artikels fokus är två huvudpunkter: den första är implementeringen av psykologisk säkerhet i 24/7-säkerhetskritiska operationer, den andra är ifall, och i vilken utsträckning är, grunderna för psykologisk säkerhet implementerade inom STCW som i sin tur dikterar minimikraven för professionella sjöfolk. Psykologisk säkerhet inom lagarbete i säkerhetskritiska verksamheter beskrivs genom en narrativ litteraturoversikt. Tillämpningen av psykologisk säkerhet i olika säkerhetskritiska domäner är jämförd med The Bridge Resource Management (BRM) vägledning av STCW. Dessa analyseras för att se om, och hur mycket, BRM stödjer grunderna för psykologisk säkerhet.

Resultaten tyder på att psykologisk säkerhet är väl etablerad inom olika säkerhetskritiska domäner för att förbättra teamarbetet och därmed säkerheten. Inom sjöfarts- och speciellt BRM-träning fann att psykologisk säkerhet inte uttryckligen nämns som teori, men många av dess beståndsdelar finns inom kursen och utbildningen. Eftersom det har visat sig att många grunder för psykologisk säkerhet lärs ut inom BRM-kursen är det intressant att psykologisk säkerhet inte finns som terminologi. Ytterligare undersökningar för att se om fenomenet psykologisk säkerhet kan förbättra BRM-utbildningen rekommenderas.

Nyckelord: Psykologisk säkerhet, Lagarbete, Bridge Resource Management (BRM), Sjöfart, IMO

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ABSTRACT

As the world becomes increasingly interdependent, organizations are focusing more on teamwork to improve both efficiency at work as well as safety. Psychological safety is an important part of a team's efficiency. Psychological safety is defined as a climate in which a person is safe to highlight their ideas, report mistakes and speak up without fear of humiliation or blame. Teamwork efficiency onboard is recognized by the International Maritime Authority as a key element for safety.

This paper analyzes whether and how psychological safety is integrated into the Standard of Watchkeeping at Sea (STCW) training and requirement for seafarers. This paper's focus are two main points: The first is psychological safety's implementation in safety-critical-24/7 operations, the second is whether and to what extent are the fundamentals of psychological safety implemented within the STCW which dictates the minimum requirements for professional seafarers. Psychological Safety within teamwork in safety-critical operations are outlined through a narrative literature review. The appliance of psychological safety in different safety critical domains is juxtaposed to The Bridge Resource management (BRM) guided by STCW. These are analyzed to see whether and how much BRM supports the fundamentals of psychological safety.

Results indicate that psychological safety is well established within various safety-critical domains to enhance teamwork and thus safety. Within maritime and especially BRM-training it was found that psychological safety is not explicitly mentioned as theory, but many of its constituents are found within the course and training. As it is shown that many foundations of psychological safety are taught within the BRM course it is interesting that psychological safety is not present as a terminology. Further investigation to see if the phenomenon of Psychological Safety could improve the BRM training course is advised.

Keywords: Psychological Safety, Teamwork, Bridge Resource Management (BRM), Maritime, IMO

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ACRONYMS AND TERMINOLOGY

STCW	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers
BRM	Bridge Resource Management
CRM	Crew Resource Management

1. INTRODUCTION

This chapter aims to introduce the reader to this study. It starts with a background as to why psychological safety is important. Later it moves on to the aim and research questions and finishes off with the delimitations of the study.

1.1 Background

The maritime industry is considered a safety-critical branch for the crew members in particular, since mortality and injuries are more common at sea than on-land occupations (Platenkamp, 2021). Unsafe acts are the most common cause for injuries, and these unsafe acts are linked directly to psychological factors affecting the crew member's attitude towards safety. Available resources such as navigational-aid equipment and the crew member's ideals are two - very relevant - examples of these psychological factors (Yuen et al., 2020).

More often than not, catastrophic incidents in maritime are the sum of numerous small things going wrong, this is known as an error chain. Ambiguity -not to be mistaken for inexperience or incompetence because ambiguity can be present in stressful complex situations even for experienced members- confusion, communication breakdown, are very relevant factors that add to the error chain and affect the outcome (Swift, 2004, p. 4). Regardless of why these things happen, be it inexperience, incompetence or lack of training amongst other reasons, crew members are not always capable of voicing concerns (Swift, 2004). While these concerns may seem as an unfounded fear, it is very possible and likely that they could identify a serious danger (Swift, 2004). Moreover, research findings indicate that seafarers are subjected to feelings of isolation, uncertainty, bullying and victimization (Randall, 2013). Additionally, the COVID-19 pandemic had effects which strengthened these negative effects on seafarers' psychological health (International Maritime Organisation, 2021, HTW 8/3/5). Randall (2013) also states that "improving seafarers' psychological safety, mental health and physical well-being will consequently improve onboard operational safety" (p. 9) in addition to urging the application of fundamental concepts such as diversity, equality, equity and inclusion at all levels of shipboard operations and maritime training. All of the above states the need for a culture of safe operating for crew members.

Psychological safety is a phenomenon which improves teamwork across various fields (Edmondson, 2018). As companies and industries develop, teams are becoming noticeably more interdependent and many decisions require careful planning (Edmondson, 2018). Teamwork is becoming a more vital part for any industry or company that wants to thrive (Edmondson, 2018) and the same statement includes the crew within the ship organization and especially the bridge team (Gregory & Shanahan, 2010, p.69). The aim of this report is to do a narrative literature review of psychological safety with two main parts of focus: the first is how psychological safety is implemented in safety critical occupations in general. The second is whether the maritime industry is cognizant of the phenomenon of psychological safety and to what extent the foundation for psychological safety is implemented through the Standard of Watchkeeping at Sea (STCW) – which dictates the minimum training needs that professional seafarers must comply with.

The book by Edmondson (2018) *The Fearless Organisation* Clearly defines the concept of psychological safety as well as mentions several studies that focus on the effects of psychological safety in teamwork in various fields. The book is therefore considered one of the main references and analysis points for this paper. The Bridge Resource Management (BRM) course however, aims to improve teamwork and reduce the margin for mistakes

(Barić et al., 2018). The BRM course is based on several theories and research. One of which is a book written as a course literature for BRM and published by Great Britain: Maritime and Coastguard Agency called *The Human Element* (Gregory & Shanahan, 2010) and it contains chapters about making mistakes, learning and developing, communication, working with others and human behavior. It is therefore a vital piece of the puzzle for the advancement of the maritime industry. Especially since the most prevailing factor for accidents happening in said industry is human error (Barić et al., 2018). The behavior of the crew, regardless of position or rank, seems to cascade down the path of least resistance, this behavior is affected by various reasons such as their psychological -as well as physical- well-being in terms of capacity, expectations, management style and company culture. Which indicates that unsafe behavior is a result of a not-so-well done system (Gregory & Shanahan, 2010). Moreover, psychological capital, which is a “a positive motivational state that may be possessed by seafarers” (Yuen et al., 2020), was proven to be affected by factors such as superiors’ behavior, a balanced work/rest schedule and most importantly -for relevance- the support of colleagues (Yuen et al., 2020).

A study by Edmondson (2018) on medical errors showed that better teams do not make more mistakes, instead, they report more. Which means that “better teams” talked more about errors and how to prevent them. This climate of openness, ability to admit to mistakes in order to solve them or ask for extra clarification are some of the key elements for achieving a psychologically safe workplace. In other words, a psychologically safe work environment allows for team members to speak up, which improves team efficiency, productivity, and reduces errors made, which is eventually a huge win for the organization (Edmondson 2018). Psychological safety means that a person is not hindered by fear, is ready to share their ideas in the team that will listen, and give feedback to develop. It is therefore not limited to team-organization relations, but even relations in the team itself. By being able to present one’s true self, the team is much more efficient at knowing each other’s capabilities as individuals and as a collective, and is therefore capable of solving harder tasks, and developing faster when experiencing failure or near misses (Edmondson, 2018).

1.2 Aim of the study

This thesis aims to analyze two main points: first, psychological safety’s implementation and effects on teamwork across multiple 24/7-safety-critical operations such as hospitals and aviation. Secondly, STCW-courses regarding bridge teamwork. The goal is to investigate whether or not the concept of psychological safety has been integrated into: Bridge teamwork specifically, and research in the maritime organization in general. If psychological safety has been integrated in the training of bridge teams, then the report will research to which extent and discuss what possibilities are there for future research. If however, psychological safety has not been applied in mentioned literature, this report will discuss the possibilities of integrating psychological safety to the Bridge teamwork training.

1.3 Research questions

1. How is psychological safety perceived by scientific research within the maritime domain?
2. What are the key elements and similarities between bridge teamwork and teamwork in 24/7 safety-critical operations in different fields (aviation, hospitals)?
3. To what degree does the concept of psychological safety exist or does not exist in the BRM course literature?

1.4 Delimitations

In the analytical phase, this report will only discuss teamwork and communication within a team, as those are the mainstay in achieving psychological safety. The effects of psychological safety however, will not be limited to teamwork, but to the results of its implications -or lack thereof- on the team's performance, and the results in comparison to the respective tasks.

This paper will discuss the existence -or lack thereof- of fundamentals of psychological safety in the theories that the BRM courses are based upon according to STCW Code A-II/1; A-II/2 (2010). and will not discuss the implication of psychological safety in BRM course held by any specific training organization.

This report is a narrative literature study with two main limitations: the first limitation is the observer's effect which limits the possibilities of gathering the qualitative data through interviews since the observer's effect means that observing something might change the outcome.

The second limitation is time, Since this research is time-limited to ca 400 hours it is simply not enough to go through all literature regarding psychological safety onboard or in the entire maritime industry, however, The authors have evaluated that the information gathered and the literature studied is sufficient to understanding the concept of psychological safety onboard and its effects. As well As more references to be added during the process. This was done in accordance with (Green et al., 2006).

2. METHOD

This section is divided into three subsections explaining how the research was performed, how the data was gathered and evaluated, what was included and excluded as per the criteria relevant to the paper, as well as the method used to analyze the data.

2.1 Data gathering

Gathering the literature and research followed a qualitative approach in accordance with (Denscombe 2018, Ch 17) as well as (Green et al., 2006, 105, 108, 109).

Gathering the data for this research was through:

- 1) Online search from different search engines and databases that are accessible for any person with a Chalmers Log-in, such as:
 - A. Google / Google Scholar
 - B. Chalmers library, Chalmers databases such as Scopus, Sciencedirect.

The following is a list of the relevant search terms that were used in the online databases:

- Psychological safety.
 - Safety culture.
 - Human element.
 - Psychological safety in maritime.
 - Psychological safety onboard.
 - Bridge resource management.
 - crew resource management.
- 2) Books, E-books and Audiobooks: found by authors with the help of specialists in the human factor onboard, and bridge resource management and leadership. The books are either in:
 - A. hard-cover form.
 - B. Audiobooks through online services, i.e Audible.
 - C. E-books found through the databases mentioned above.

All information sources mentioned above, were gathered between 01/11/2021 and 15/12/2021 according to (Green et al., 2006).

The material chosen to undergo the CRAAP test is the following:

- Swift, Bridge Team Management, a practical guide, 2004
- The Human Element, a guide to human behavior in the shipping industry, TSO, 2010
- *The fearless organization: Creating psychological safety in the workplace for learning, innovation, and growth.*
- Randall, Bridge Resource Management, Introduction and Training for Merchant Marine Officers, 2013.
- *Problems that occur in a team: Learning from maritime accidents via simulation training.*
- *Framework of on-board team effectiveness: a qualitative study of shipping industry.*
- *Psychological safety: A systematic review of the literature.*
- *Safety Culture in the Maritime Industry: Psychological Safety and Leadership: An exploratory study regarding safety perspectives within a heavy lift shipping and installation company*
- *Safety behaviour at sea: Policy implications for managing seafarers through positive psychology.*
- *International Chamber of Shipping (ICS), the Bridge Procedures Guide, 2007*
- *International Maritime Organization, Resolution A.893 (21), Guidelines for voyage planning*
- *Maritime and Coastguard Agency, Marine Guidance Note 315, Keeping a safe navigational watch on merchant vessels*

- *Maritime and Coastguard Agency, Marine Guidance Note 379, Navigation: use of electronic aids*
- *Guidelines for Offshore Marine Operations (GOMO), Revision: 0611-1401, 2013*
- *Vessel Inspection Questionnaires for Oil Tankers, Combination Carriers, Shuttle Tankers, Chemical Tankers and Gas Tankers (VIQ 7), Edition Rev 7, 2019*
- *Marine operations: 500m Safety zone, Marine Safety Forum, 2017*
- *Risk management in the national system, a practical guide, AMSA*
- *Is physical and psychological work stress associated with fatigue in Danish ferry ship employees?*
- *The Human Factor in Maritime Transport: Personality and Aggression Levels of Master Mariners and Navigation Students*
- *Approaches to teamwork and leadership training in maritime education and training institutions: a comparative analysis of the perspectives of seafarers towards teamwork and leadership across different regions*

2.2 Data evaluation

The literature gathered for this paper was put through a CRAAP test model for evaluation. The CRAAP test is a test to check the objective reliability of information sources across academic disciplines. CRAAP is an acronym for Currency, Relevance, Authority, Accuracy, and Purpose (all explained below). Due to a vast number of sources existing online, it can be difficult to tell whether these sources are trustworthy to use as tools for research. The CRAAP test aims to make it easier for educators and students to determine if their sources can be trusted (University of the West of Scotland, 2022).

CRAAP stands for (University of the West of Scotland, 2022):

- **Currency:** to evaluate the factuality of the information in each of the literature, as well as the publish date and when it was last updated.
- **Relevance:** to evaluate whether the source is relevant and to what degree, and whether it enriches the answers of the research questions or not, that decides whether the source is appropriate to use in this paper.
- **Accuracy:** Where did the information in the source come from, thus peer reviewed articles are preferred.
- **Authority:** To research the author/s of the source, how known they are in the field, the organization to which they are linked, as well as their previous publications, to check their credibility.
- **Purpose:** Why is this information published, whether the source is deemed objective and if it presents new facts or information, as well as evaluating how well the text is written.
- **Publication:** Finding out who the publisher is and how known the publisher is within the discussed domain and knowing whether the publisher is an organization or a private person.

2.3 Inclusion / Exclusion criteria

When investigating the literature that passed the CRAAP test, the inclusion/exclusion criteria was set as follows: The literature regarding other industries than maritime had to be about safety-critical domains i.e. aviation and healthcare, other industries which are not considered 24/7-safety-critical, such as entertainment, were excluded. Regarding research within the maritime sector, only research about teamwork's effects on seafarers' psyche and efficiency was included, other factors that may affect the seafarer's psychological state such as fatigue and work hours were excluded. Lastly, when researching Bridge resource management course theory, only literature concerning the work environment with regards to communication in a team was included, tasks such as operating navigational equipment, Bridge procedures and voyage planning were excluded. These criteria, along with the data evaluation phase, led to the inclusion of 4 books regarding the BRM courses, 5 articles, as well as 3 papers from the IMO.

2.4 The narrative review of the literature

When going through the literature that was gathered, a narrative analysis was used to pin where the psychological safety front is in the maritime industry and especially in STCW-courses regarding bridge teamwork. In summary, This report is going to be using and analyzing secondary data to generate new, primary data and information within the discussed topic (North Carolina State University Libraries, 2020).

The narrative analysis and review of the literature (Green et al., 2006, 110, 111) (North Carolina State University Libraries, 2020) and (Denscombe, 2018) where the main theme is psychological safety. Content and themes from the literature were matched with the definition of psychological safety and its effects. Major areas of agreement -and disagreement- were highlighted then summarized or paraphrased. The authors' interpretation of these highlights and different definitions was then divided into sections respective to the three research questions. To further study the subject and deepen the understanding of psychological safety and its application in maritime, case studies done by Edmondson (2018) were compared to incidents in the maritime industry to highlight the similarities and differences in the teamwork and thus suggest whether psychological safety is studiable in these maritime incidents in the same manner as studying the incidents in aviation and healthcare brought forward by Edmondson (2018).

3. THE LITERATURE REVIEW

3.1 Psychological Safety

"Psychological safety is broadly defined as: a climate in which people are comfortable expressing and being themselves, more importantly when people have psychological safety at work they are more comfortable sharing concerns and mistakes without fear of embarrassment or retribution, they are confident that they can speak up without being humiliated, ignored or blamed." (Edmondson, 2018, Ch1) By reducing the threats to the individual, the behavior mentioned above may have a positive impact on the individual themselves and on the whole organization (Newman, et al., 2017). Since our entire modern economic system is built on decisions and actions, teamwork is a vital component for the economy's benefit (Edmondson, 2018). As Procedures are set to ensure safe actions, working

conditions as well as reduce risk, psychological safety is imperative to make certain that these procedures are followed (Edmondson, 2018). Working in a psychologically safe climate means that mistakes or near misses aren't only reported, they are discussed and solved rather than taking the path of least resistance. Psychological safety means that the person feels safe enough to take a different type of risk, an interpersonal risk. Which can even surpass one's sense of physical safety (Edmondson, 2018). In addition to overcoming fear, speaking up requires people to understand that their reasoning and vision for possibilities as well as interpretation of reality is different. Even the same situation puts different pressure on different individuals. It is necessary to keep in mind the natural hierarchy of personal needs for different individuals (Gregory & Shanahan, 2010). Most humans find difficulties when challenging another in these interpretations, which highlights the necessity of investing in empathy and communication training. (Gregory & Shanahan, 2010).

Edmondson (2018) also put a definition to the word teaming, "Teaming is the art of communicating and coordinating with people across boundaries of all kinds, expertise, status and distance." (Ch1) A very similar definition is also given by Swift (2004): "*IMO STCW B-VIII PART 3.1: 5.14: members of the navigational watch should at all times be prepared to respond efficiently and effectively to changes in circumstances.*" When these changes happen the need for teamwork becomes paramount because the team members will have to make decisions beyond their individual capabilities (Swift, 2004) In order to achieve a goal that the crew members share, the crew members therefore require skills for good teamwork and effective interaction. This is because the completion of individual tasks leads to achieving a bigger goal than each of the tasks (Gregory & Shanahan, 2010).

Taking interpersonal risk is a difficult thing to do whether in the workplace or otherwise, mainly because taking this risk can have grave consequences and little immediate reward, sometimes no rewards at all -since avoiding a disaster isn't exactly a reward per se. However, managing interpersonal risk, whether actively or subconsciously, is a constant recurring task that everyone goes through daily, be it sharing an idea, asking a question, or voicing a concern. Avoiding these acts is defined as a psychologically unsafe workplace, otherwise explained as a culture of silence. The effects of such a culture in a workplace can manifest in creating the illusion of success which is a synonym for failure, sometimes even causing disasters that may severely damage or destroy companies or even cost lives. The lack of psychological safety suppresses the organization's and the individual's possibilities for development. Au contraire, a psychologically safe workplace is an environment in which employees and their opinions are valued, it is characterized by candor, openness and frankness, as well as clear, direct and candid communication. Psychological safety is therefore not a perk but a requisite to produce high performance and avoid mistakes. Twenty years of research shows that psychological safety has tremendous positive effects on learning, engagement, creativity, innovation, problem solving, performance and reducing accidents in many different industries, examples of which are automobile manufacturing, entertainment, aviation and healthcare (Edmondson 2018). Research has also shown that shared perceptions of team attributes can affect psychological safety among colleagues, which in its turn can influence performance and commitment. For example, if the individual team member sees that the rest of the group has a similar understanding of how the system works then they will tend to feel more psychologically safe. When it comes to the group as a whole, research has found that certain things such as shared team rewards and engagement are positively related to psychological safety. (Newman, et al., 2017).

Trusting and supportive interpersonal relationships with coworkers can lead to a feeling of psychological safety. This can manifest itself when the person shows and employs themselves without a fear of negative consequences to their well-being, status or career. Furthermore, psychological safety can lead to better work performance and commitment (Newman, et al., 2017).

Since psychological safety is a climate, it means that each part of the organization has a role in creating this climate, whether a CEO, a team leader or even a team member. It is however much easier and more effective that the implementation of psychological safety starts from top-down rather than bottom-up since managers and team leaders play a major role in creating the atmosphere in the workplace, examples of such atmospheres is fear, in which leaders welcome only good news denying them from hearing the truth regardless of how crucial that is, or managers who think setting high, unreachable standards is good management. Contrastingly, a leader willing to admit unknowingness is powerful when setting an example to engage the team members, in addition to a compelling company purpose. Encouraging employees to speak up about hazards and other concerns is a stupendous motivation for the employees to ensure their and others safety. (Edmondson 2018).

3.2 The maritime research

Only one of the following collections of articles researched psychological safety, the rest touched on subjects regarding teamwork, the working psychological environment and speaking up which are some of the fundamentals of psychological safety but did not mention psychological safety by name. The article by Platenkamp (2021), *Safety Culture in the Maritime Industry: Psychological Safety and Leadership: An exploratory study regarding safety perspectives within a heavy lift shipping and installation company*, studied psychological safety onboard by interviewing crew members of various ranks, the results of this research showed that psychological safety is in fact starting to take roots for the mentioned crew members where positive feedback is more welcomed, and that safety is “done together”, the article concluded that leadership affects involvement and open communication onboard.

The paper by Barić et al. (2018), *Problems that occur in a team: Learning from maritime accidents via simulation training*, studied mistakes that can be done in a team highlighting the causes of human error, one of which is a hostile work environment, as well as the linear hierarchy especially regarding the chief engineer and the captain. The paper discussed how harmony in a group and open communication are crucial for achieving the goal as a team.

Jha (2020), published a paper *Framework of on-board team effectiveness: a qualitative study of shipping industry*. Where the purpose of the study was developing a framework for onboard team effectiveness using qualitative interviews from a sample of 44 Indian seafarers, the result of the study pointed out that two forces were at play, safety and need of money. The first strengthened the bond of the team because of the importance of physical safety, overcoming an emergency drove the team to work as a unit, regardless of rank and duty, while differences such as personal need of money, short contracts, languages and cultures tend to push away the sense of teaming -explained in introduction-. It also showed that senior officers' behavior affects the team members at a personal and a social level. The shared goal is therefore crucial for the team to succeed, and the one's trust in their teammates is essential for coming out of the situation alive.

Yuen et al. (2020). conducted a study on 202 seafarers based in Singapore, the paper published for this research is named *Safety behaviour at sea: Policy implications for managing seafarers through positive psychology*. The paper elaborated about “psychological capital” as a positive motivational state which the seafarer can possess, which Affects the seafarer’s safety behavior. Much like psychological safety, psychological capital can be caused and maintained by training, practice, as well as leadership intercession. The paper stated that individuals demonstrate the group’s ideals to stay accepted within that group. Several studies that the paper referenced suggest that the employee’s identification with a group and the sense of belonging created from that identification has very beneficial impacts on the member’s motivation, derived from positive emotions such as confidence and self-esteem, as well as pride. The paper then connected these emotions to social support, defining social support as “an actualisation or perception that an individual is cared for, and is a part of a supportive social network”, which is corresponding with psychological safety’s definition that the member who speaks their mind should not be ignored.

3.3 Bridge resource management theory

The IMO’s *Upgrade model course 1.21 on Personal Safety and Social Responsibilities* (International Maritime Organisation, 2021, HTW 8/3/5) has suggested the introduction of psychological safety into the maritime industry and the training in team management for the following reason: Psychological safety supports diversity, equality and grants a successful integration of marginalized groups to ensure a safe work environment in any kind of workplace, this can only be achieved by active attention. There are important points that should be considered for inclusion in the PSSR model such as promoting self-awareness and addressing personal biases, encouraging clear, open and consistent communication, speaking up when inappropriate behavior and all kinds of aggressions take place, respecting boundaries within the team and providing confidential reporting methods on given complaints. Investing in education and working on psychological safety within the maritime are quite necessary to improve womens’ role in this industry, as the percentage of women that are a part of a seafarer workforce on cargo ships is only 1%. Dominica addressed Goal 5 of the UN 2030 Agenda for Sustainable Development Goals (SDGs): “Achieve gender equality and empower all women and girls”. With women’s participation and success will be evidenced with an advancement rate in the maritime industry. Evidence of success will be measured by increasing women’s role and progress in the maritime industry.

Proposals in order to create a flexible framework that supports psychological safety principles and behavioral criteria with just culture in the maritime industry in order to provide a safer working environment. IMO’s *Upgrade model course 1.21 on personal safety and social responsibilities* (International Maritime Organisation, 2021, HTW 8/3/5) suggested four additional hours for safe working practices and the effect of management on human relationships on board ships. The following points are this document’s sponsors’ proposal: adjusting the priority level attributed to IMO model course 1.21 from priority 4 to priority 2; take the review of IMO model course 1.21 on Personal safety and social responsibilities into consideration, as presented in annex 1 to document HTW 8/3/5 and extend the duration of training by four hours; organize a working group that is responsible for designing the IMO model course 1.21 content which will provide a solid education content that will introduce an appropriate maritime workplace behavioral norms while taking into consideration the essential human elements of psychological safety. The Sub-Committee is requested to

consider the previous information and particularly consider the fundamental importance of a psychologically safe maritime workplace culture that will effectively improve operational safety meanwhile achieving a sustainable and equitable maritime industry and note the previous points that were set in the PSSR model (International Maritime Organisation, 2021, HTW 8/3/5).

Bridge teamwork course in Chalmers University of Technology includes the competences put forward by the STCW Code A-II/1; A-II/2 (2010) for the BRM course, The Chalmers version of the Bridge teamwork is based upon several theories and books (explained in the data evaluation subsection) which are reviewed in this subsection as per the method.

The human element by Gregory & Shanahan (2010) is a book that breaks down -among other things- the human nature as well as defines and discusses a concept known as *Just Culture*. The human nature can be broken down to eight different elements which are (Sec:2.1, 2.2):

- People actively making sense of things.
- people taking risks.
- People making decisions.
- People making mistakes.
- People getting tired and/or stressed.
- People learning and developing.
- People communicating with each other
- People working with each other

The results of using the legal way to look into cases that are related to negligence are rarely just. The prosecution tends to make the story seem as if it was one person's fault, which ends up being the organization's scapegoat. This promotes fear and mistrust among the employees and encourages a culture where honesty is criminalized. The book mentioned a system of reporting by programmes called "just culture", which are programmes that can improve safety attitudes of the entire workforce. Those programmes are made to avoid fear by the crew member and employees who would inspect the problem should have expertise and knowledge of the technical problem and be able to be biased. Moreover, the benefits of a "just culture" are as stated: "Increased reporting of unsafe incidents and accidents – including trends that indicate future problems developing • Increased trust between all levels of the workforce – which accelerates the organization's journey towards greater safety maturity • Decreased actual numbers of adverse incidents and accidents • Decreased operational costs – due to safer behavior, higher workforce motivation and morale, and increased productivity This last benefit has allowed Shell to make a convincing case for safety within a 'just culture' to be transformed from a cost center to a profit center" (Gregory & Shanahan, 2010, p.55). "A 'just culture' is founded on two principles, which apply simultaneously to everyone in the organization:

- Human error is inevitable, and the organizations' policies, processes and interfaces must be continually monitored and improved to accommodate those errors.
- Individuals should be accountable for their actions if they knowingly violate safety procedures or policies." (Gregory & Shanahan, 2010, p.53). The prerequisite for the first principle is having a reporting system trusted by the team members for the members to report anything they deem necessary. This trust is developed by how the organization implements the second principle, defining, investigating, and attributing accountability (Gregory & Shanahan, 2010, p.53). This has made a convincing enough

case so that 'just culture' programmes have started in industries such as aviation as well as the health sector (Gregory & Shanahan, 2010).

It's common that peoples' assessment gets affected by judgmental biases. People are naturally biased in how they interpret and experience the world around them. More often than not when people experience a situation that they find threatening, they tend to defend themselves in a way meant to protect their self-image. This self-image on the other hand tends to be over simplistic and not so realistic. However, knowing about these biases can help mitigate their effect, and they can be countered by employing evidence-based judgments and assessments. Furthermore, groups can have different things in common such as location or interest. On the other hand, teams are united by a common goal where each team member has a clear role to play to achieve that goal. Therefore, teamwork needs a set of skills to be effective (Gregory & Shanahan, 2010). An example of these skills is leadership and the capability of motivating others as well as supporting your teammates and helping them to adapt to the changing demands of the environment. Moreover, it is important to have clear and effective communication as well as being open to others' suggestions. These skills can be learned and trained in a manner similar to their practical counterparts. Additionally, each person makes sense of the world in their own unique way. This can be due to many influential factors such as their psychology, self-concept, culture, personal experience and social needs. This essentially means that the same situation is viewed differently by each person involved. Therefore, empathy is crucial for understanding other people's perspective, which can help in supporting teammates and colleagues when needed and even in making communication better and more clear. The differences mentioned above associated with differences in ranks and cultures, can make it difficult for crew members to challenge their colleagues. Therefore, that would require some training which means an investment by the shipping industry (Gregory & Shanahan, 2010).

Many organizations require incident reports when things go wrong in order for them to stay in the loop. However, a conflict can arise as these reports can affect reputation, opportunities and bonuses. Thus, the lack of them can lead to a false sense of organizational well-being. On the other hand, even when incidents are reported, these reports tend to improve efficiency rather than safety. The policy managers tend to favor efficiency instead of maintaining high visibility of their teams, as they will be praised for their (Gregory & Shanahan, 2010).

Similar mental models: team members have a unified understanding of each other's responsibilities and tasks and are aware of their roles. Mutual trust: team members realize their actions and all the consequences related to those actions and how they affect the overall goal. Effective communication: team members make sure that the work flow is done with high accuracy. Mutual monitoring: in the case of mutual monitoring, team members should be able to monitor each other's performance and identify other colleagues' mistakes and give feedback on their performance. Back-up behavior: This is when all the team members are aware of their responsibilities and employees in this case will be able to predict and avoid near problems as they are aware of the consequences. Adaptability: adaptable team members are usually aware of continuous changes, behave according to them and they understand any kind of developments and their implications (Gregory & Shanahan, 2010).

Bridge team management A practical guide, is another book discussing and setting models for the BRM course, it argues that operating a ship requires a crack team operating cutting-edge technology, unfortunately that is not always the case, seafarers vary in abilities and quite often work outdated equipment. Nevertheless, each crew member aboard any ship is vital for safely completing the voyage by taking full advantage of any and all available resources (Swift, 2004). For that to happen team management is needed, and team management can be defined as “the interaction required within the team for such a system to work” (Swift, 2004, p.2). Hierarchical and cultural boundaries must be conquered by enhancing -among other things- communication and crew management in order to efficiently operate any bridge (Swift, 2004). Furthermore, when a member is demoralized safety becomes jeopardized, thus, high morale is an indispensable factor for any crew member to ensure safe operation. This can be carried out through recognizing one’s role in a team, giving credit when due and acknowledging the results of the efforts, as well as carefully ameliorating the member’s deficiencies (Swift, 2004).

The main ideas relevant to this paper in the book *Bridge resource management: Introduction and Training for Merchant Marine Officers* are the following: Situational awareness can be increased through good communication. This can be done by asking the right questions to help maintain a high level of situational awareness. Such questions should be clear, concise and accurate. Moreover, the answer to these questions needs to be of the same nature. Commanders can contribute to increasing the situational awareness by making sure to give clear orders and the order carrier needs to be focused to make sure that they deliver the order as intended by the commander. Commanders need to encourage crew members to ask questions and add input to the situation (Randall, 2013).

3.4 Comparing case studies

In this section, case studies done by Edmondson (2018) from both aviation and the healthcare sector are summarized and brought forward to explain when and how psychological safety was vital, and how the lack of it caused not only enormous economic losses, but human casualties as well, and compared from a teamwork aspect with examples from the maritime industry

3.4.1 Aviation and Healthcare

The first example is the tragic incident known as the *Tenerife airport disaster* where, in summary, a KLM 747 and a Pan Am 747 airplanes collided on March 27th, 1977 and caused the loss of 583 lives (Weick, 1990). The study concluded that one of the reasons for the collision was an inaccuracy in communication caused by hierarchical distortion (Weick, 1990). In other words, the co-pilot did not feel psychologically safe enough to be able to speak up (Edmondson, 2018).

A different example is known as *The Hudson Miracle* which provides a prime example of how psychological safety and open communication was an important reason that the crew was able to successfully land the US Airways Flight 1549 in the Hudson river with zero human casualties. Despite the problem they faced - birds - being described as unprecedented, and the crew having no prior procedural training on this specific issue, making it immensely complex, with severe consequences (Edmondson, 2018). Two things can be concluded from this case, the first is that the pilot's openness for ideas, and the co-pilot's candor and clarity in communication, associated with trust between the two crew members, are prime examples of how psychological safety works in action, the second is that psychological safety does not require hours upon hours of going back and forth with ideas, it can be very well practiced in short, clear, communication and understanding between the team members (Edmondson, 2018).

Edmondson (2018) also mentioned in her book another case study in the healthcare sector where Betsy Lehman, who is a healthcare columnist at *The Boston Globe*, passed away at the Dana-Farber Cancer Institute on December 3rd, 1994. The reason this was researched is that the cause of death was not the breast cancer that Betsy suffered from. But rather a medical error. The institute where Lehman sought treatment had a reputation for its success in treating difficult cases, its cancer research in addition to its patient care. However, the informal communication between staff did not allow for questioning or routine checking. The treatment Lehman received as part of the clinical trial was an ordinarily used chemotherapy but in an especially high dose "barely shy of lethal" along with a second drug to boost the effect of the first over a four day course due to the avant-garde stem-cell transplant Lehman underwent. Since this treatment plan was a research trial the chemotherapy dose was out of the standard. The mistake that happened was that the entire four-day dose was ordered for each day for Betsy, meaning Betsy Lehman received four times the dosage she was supposed to receive. What is remarkable is that another patient was rushed to the intensive care unit after collapsing from receiving the same incorrect dose. The error was discovered by a routine data check three months later, instead of a clinical inquiry. The questions Edmondson (2018) ask is why no one question what had gone wrong, whether Lehman trusted the institution too much to question her own extraordinary symptoms, why the pharmacists, and the nurses did not question the remarkable dose that was four times as high as an already "shy of lethal" dose,

whether the nurses' trust in the doctors left them unconcerned, or whether they were reluctant to speak up. The only known fact is that no one accurately understood the significance of her condition. Edmondson (2018) quotes Betsy's mother to explain that if someone had stepped up and questioned the signs, Betsy might have lived (Edmondson 2018).

3.4.2 Maritime incidents

On November 7th, 2007, The fully loaded, ca 274m long container ship Cosco Busan struck the Delta tower of the Bay Bridge on her way out of San Francisco in zero visibility. Causing a \$100 million disaster. It is worthy mentioning that everyone in the Chinese crew was new to each other, as well as the ship, sailing in that particular area for the very first time, since this was their second voyage with the ship because of an ownership change. The reasons for this incident were the following: A pilot's degraded mental ability due to them taking 10 different prescription drugs, ineffective communication between the Master and Pilot elaborated further both before departure and during the accident, the Master's lack in oversight of the progress of the voyage and the Pilot's performance, as well as a failure by the ship manager to train the crew and lastly, the US Coastguard failure to appropriately manage the Pilot's medical condition. The case study highlighted that the investigation report disclosed that the team failed in all areas known to drive effective team performance. At first contact, the Master felt unfriendly 'coldness' from the Pilot, which could emanate from difference in ethnicity, but alas, the crew was reluctant to challenge the Pilot throughout the voyage. When one crew member commented a concern to a colleague it was in Mandarin, and disregarded. The voyage also lacked briefing, no questions were asked about the plan, the poor visibility, deployment of tug nor the course changes. Silence confusion over leadership, neither the Captain nor Pilot showed any interest in leadership, motivating, involving, planning, nor consulting other team members. All of these factors associated with the crew members' silence in presence of hierarchy made mutual monitoring nearly impossible, allowing no room challenging nor backup. The Pilot's incompetence due to their medical condition is undeniable, the outcome however, could have been different and non-disasterous had there been willingness on either side to function as a team. It is stated that the crew and Pilot lacked knowledge in team management, each other's abilities, cultural differences and communication in a team. Contrastingly, incidents such as this are avoided constantly by teams that do function well (Gregory & Shanahan, 2010).

The second incident occurred on clear afternoon in April 2003, when the Ro-Pax ship Pride of Provence carrying a total of 641 persons was approaching Dover port while another ship, Cezanne, was berthing, when entering the breakwater arms, the Pride of Provence's port side stern collided with the breakwater, causing heavy damage to the ship and numerous injuries to the persons onboard but luckily no loss of life, it is also declared that if the ship hadn't collided with the breakwater, a close-quarter situation would have taken place. The report deemed communication to be the main cause for this incident. The case study mentions clear and relevant communication between the crew members onboard during the execution of the plan set by the Master. However it highlights a deficiency in the briefing, meaning that although the communication during the operation was well-done and according to regulations by experienced crew-members, and regardless of the Master's briefing containing intentions for the approach to the berth, the briefing lacked an explanation of how the intention will be carried out. That resulted in ambiguity for the rest of the bridge crew when monitoring the progress. Had the plan been clear with set course and speed as well as pre-planned changes in them, the rest of the crew would have been able to monitor the ship's advancement using

different functions from the radar such as parallel indexing or target trails, or even shore based land-marks visually. But since the briefing was insufficient, the monitoring could only happen in real time with little vision for the future, heavily reducing the crew's situational awareness, thus, when the ship's stern closed in on the break-water, it came as a surprise to all crew members. Their inability to anticipate deprived them of the ability to take necessary actions. It was therefore deduced that the Master was single handedly orchestrating a multi-person maneuver. This study highlights two requirements for successful communication, the first is the need for multiple perspectives. People's understanding of reality varies, but is still similar enough to be able to explore the differences, the second is being able to share these differences. Exploring these requires a dialogue in which people are capable of sharing these differences aloud to better understand these differences (Gregory & Shanahan, 2010).

The third case took place on the 24th of March 1989 around the shoals of Alaska, where the tanker Exxon Valdez ran aground hitting Prince William Sound's Bligh Reef on her way to Long Beach, California. The grounding caused a spill of no less than 40.9 million liters of crude oil and was recorded as one of the largest spills in United States history. In summary, the captain left the third officer in charge in the dark through confined waters (Randal, 2013). Randall (2013) accounts the error chain to the Master leaving an inexperienced third Mate who is unfamiliar with the area in charge. In addition to a huge lack of communication from both parts that manifested in the Captain leaving with no specific commands, and the Mate not voicing any concerns about his inability to navigate safely under the circumstances. Had either of them asked questions to improve communication, or had the third Mate voiced concerns about his confusion or uncertainty the error chain could have been broken (Randal, 2013).

4. DISCUSSION

4.1 Method discussion

Systematic literature review depends heavily on keywords. The keyword in this study is *Psychological Safety*, which is not explicitly mentioned in most of the material researched. Furthermore, the different standards in which the material is written makes it difficult to conduct a direct comparison. Another method would have been to use surveys and interviews. This was excluded due to the observer effect, which is defined as the fact that observing a situation or phenomenon necessarily changes it. This would have affected the results of the study making them less reliable.

Narrative literature review is influenced by the author's experience and is affected by which idea they want to deliver. While systematic literature review is based on the information available in the sources and should not be influenced by the author. The author must still be objective and systematic in their review. Even though the authors were objective in their review, personal interpretation must be taken into account

The chosen method is applicable because psychological safety onboard has been studied and researched under different titles and definitions. The comparison between the literature has been a determinant factor in identifying whether psychological safety is integratable, or is already integrated and to what degree.

Regarding the CRAAP test, it is a model used by many universities such as Chalmers University of Technology and researchers worldwide.

4.2 Results discussion

The above-mentioned information and results in the review clearly prove that psychological safety and its key components as defined by Edmondson (2018) and Newman et al., (2017) are implemented in the theory and research within the maritime domain and more specifically in BRM theories (Gregory & Shanahan, 2010; Randall, 2013; Swift, 2004) -even if under different names- but only partially (as highlighted). It is also deemed insufficient due to the fact that the IMO has proposed a model course and included the implementation of psychological safety in its model course proposal for the sake of sustainable development (International Maritime Organisation, 2021, HTW 8/3/5), improving the psychological health of the individual, and improving teamwork as a whole, which all result in safer and better financial outcomes for the maritime industry.

Similarities between psychological safety and the different maritime research put forward and highlighted in the review section agree on the need for a safer work environment, better and more open communication, eliminating interpersonal risk, and setting a work atmosphere in which social fear is reduced (Edmondson, 2018; Barić et al., 2018; Jha, 2020; International Maritime Organisation, 2021; Platenkamp, 2021; Yuen et al., 2020). All research papers analyzed in this thesis seem to agree that cultural and rank differences, fear and silence have negative effects on the safe operation of maritime vessels. None of the papers, books, or incident cases researched seem to suggest otherwise; disagreement points were not found.

Comparing the books defining and outlining Bridge Resource Management theory such as the book by Gregory & Shanahan (2010), the book by Swift (2004) and the book by Randall (2013) to the definition, effects, and implementation of psychological safety (Edmondson, 2018; Newman et al., 2017) the books clearly agree and even put forward models for reporting errors internally, as well as discussing and solving them, all while coming up with new ways to avoid them in the future. Not only that, but the books also emphasize the need to ask questions when uncertain in order to avoid disasters which corresponds with the definition and implementation of psychological safety (Edmondson 2018).

When juxtaposing the case studies of incidents in aviation and healthcare as studied by Edmondson (2018) with their counterparts in maritime studied by Gregory & Shanahan (2010); Randal (2013), it is evident that regardless of domain, if teamwork is required, communication skills must be improved. Despite all six cases consisting of different tasks being done by different people in various industries to achieve different goals, the errors made were quite similar, the fears and discomforts are the same, and the outcome is still disastrous. Obviously excluding *the hudson miracle* since it was a prime example of opposite behavior of the mistakes mentioned but instead followed the fundamentals of psychological safety and BRM theory which led to miraculous outcomes.

All the research and analysis in this paper suggests one vital action, dialogue. Asking questions, voicing concerns, briefing, debriefing, voicing intentions, speaking up, challenging, giving constructive feedback, listening and going the extra mile to understand are all parts of necessary communication for improvement on all levels, when associated with empathy and candor, the interpersonal risk becomes minimized and fear of social isolation and punishment becomes obsolete. This requires hard work, practice, and persistence to be achieved and sustained as an atmosphere, otherwise known as psychological safety.

5. CONCLUSION

As part of the purpose of this report was to investigate whether or not the concept of psychological safety has been integrated into: Bridge teamwork specifically, and research in the maritime organization in general, the authors concluded that psychological safety's foundations and principles are partially integrated into the maritime. Different research and various theories seem to share the same essence, that open communication is vital for survival and more often than not, it stops disasters before happening. Regardless of occupation and cultural differences, human nature is always complex and unique to each individual. Nevertheless similarities are undeniable. Ergo, a combination of the guidelines gathered from theories is likely the most beneficial to improve teamwork, and decrease risk and negative consequences especially in the maritime sector. This study provides an overview of the complexity in the field of psychological safety and psychological well-being in the maritime domain.

5.1 Recommendations for further research

Integrating psychological safety into maritime is still a work in progress. Despite the numerous guidelines and theories there is still a shortage in communication training. As previously constituted, psychological safety has just been proposed to be added to seafarer training. For that to happen, further research and investigation of implementing psychological safety and studying its outcomes in maritime seafarer training.

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American Library Association, ACRL Sandbox, CRAAP test

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